Experiment 8 : HOOKE'S LAW

PURPOSE:

Investigate how measurements data are simplified in order to generalize and identify trends in data.

MATERIALS:

spring, mass holder, ring stand, measuring tape in cm, graph papers, small masses of 50g,, scale, large paper clip, Unknown mass, tape.

DATE_____

AUTHOR _____

PARTNER _____

PARTNER _____

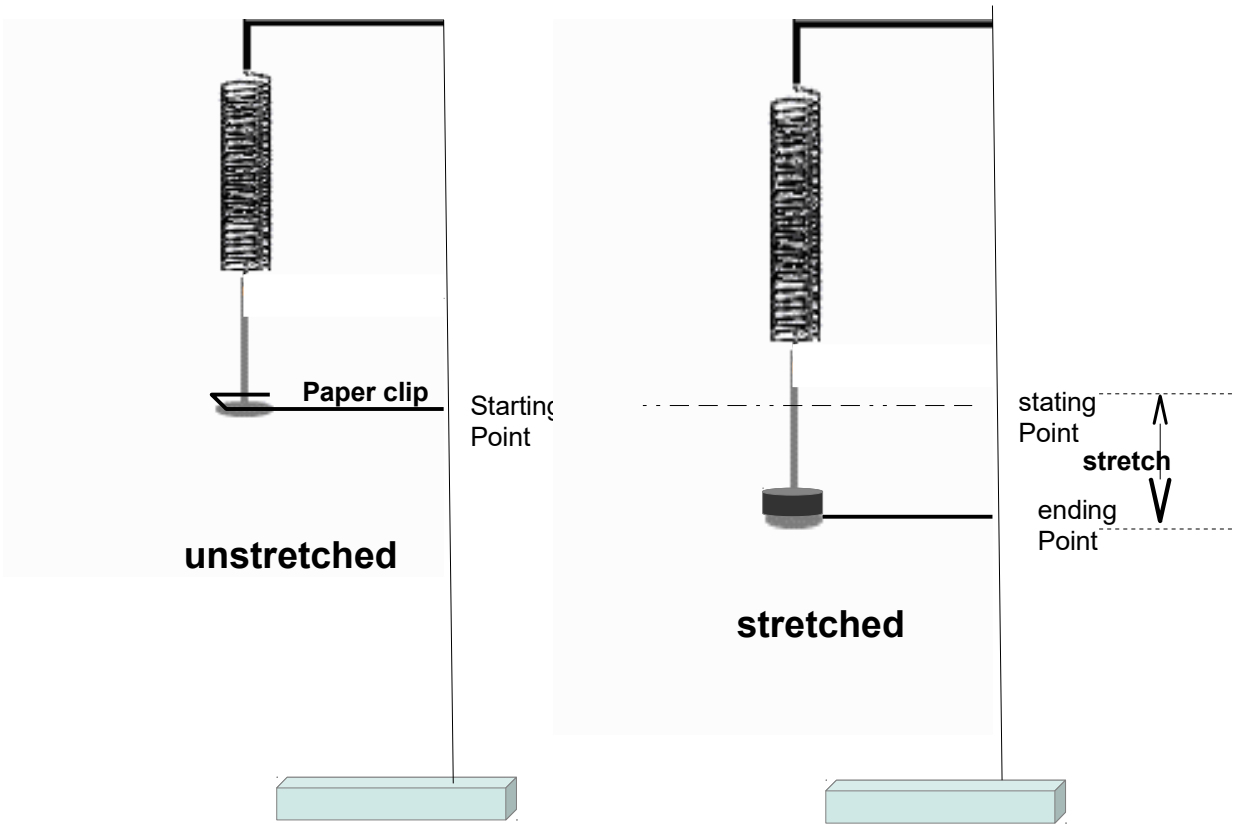
BACKGROUND:

The weigh of an object is the amount of force that gravity exerts on the mass of the object. When an object is weighted on a spring scale, the pull of gravity on the object causes the spring scale to stretch.
A relationship exists between the amount of stretch that the object produces and the amount of gravitational force pulling on the object. In this challenge, you will investigate the relationship that exist between the weight of the object and the stretch of a spring. This relationship is called Hooke's law :

weight hanging on spring = K x displacement of the spring

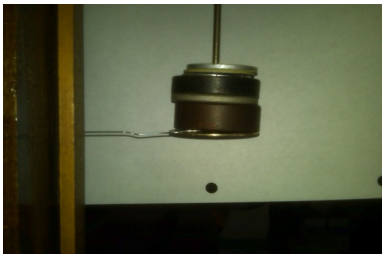
K is a constant and depends on the stiffness of the spring
(if you multiply the weight by 2, the spring stretches twice that much).

PROCEDURE:



step1: Hang the spring. Attach the mass holder on the spring. (there is no mass yet on the holder).
See above figure @ left for the set up.

Step2: Unfold your paper clip to make a pointer. See above figure @ left. (there is no mass yet on your holder). Secure the the pointer on the holder with a piece of tape.



Report your initial position Xo = _____cm
(as shown by your pointer)

step3: Put one 50g mass. If your spring is stiff, you can place a 100g mass instead.
Look at the ruler to see how far the spring has stretched.

The new position is X= _____ cm

Compute the stretch $\Delta X = X - Xo =$ _____ cm (Use step 2 previous page)

For example, if Xo= 20cm and X = 25 cm, then stretch ΔX = 5cm.

Record the stretch ΔX in the TABLE below.

Step4: Repeat the **step3** with one additional mass. Keep Xo the same. X is the only variable to change. Each time record the total stretch $\Delta X = X - Xo$. Again Xo stays constant.

Step5. Repeat step4 until you fill the table.

TABLE 2 : (Xo = _____ cm)

x-axis **Masses (g)** **force pulling down in grams**	**y-axis** **Stretch ΔX(cm)** **X - Xo**
0	0
50	

ANALYSIS:

1) Make a scatter plot *stretch (y-axis) vs mass (x-axis)* by **plotting** each data point (don't connect the dots). Then trace the **best fit line and display the equation on the graph**. The point (0,0) belongs to the graph so the y-intercept goes through the origin. Label your axis. Give a title to your graph.

2) You will be given an unknown mass (ask your instructor). You are going to predict the mass of the unknown:

A) Place the unknown mass on the holder and measure the stretch of the spring.

$\Delta X = X - Xo =$ _____ cm Xo has not changed.

B) Use your graph to predict the mass.

EXPERIMENTAL VALUE = _____ g (from the graph)

3) Use a digital scale to find the accepted value (or true value or theoretical value).

ACCEPTED VALUE = _____ g

4) Compute the percent discrepancy:

Percent discrepancy= _____ % (|accepted – experimental| / accepted x 100)

5) What happen to the stretch of the spring as the masses increase ?

6) Describe the shape of your graph ? The relationship between the stretch and the mass is said to be _____.
(exponential ? Linear ? Quadratic ? Inversely proportional ?)

7) What is the slope of the line:
Slope = _____ cm/g

That means each time the mass increases by 1 g, the stretch increases by ____ cm.
The relationship between the stretch and the mass is therefore :
stretch = _____x mass (equation of the line or y=mx with y is the stretch and x the mass)

8) This relationship is called Hooke's law. Stiffer the spring, smaller the stretch.
What do you think will happen to the slope if the spring is stiffer ?

9) Use your relationship derived in 7) to predict the mass if the stretch is 13 cm.

Mass predicted = _____-

CONCLUSION:

Was the purpose of this lab accomplished ? Why or Why not ?
(your answer to this question should show thoughtful analysis and careful, through thinking)